

Amendments to the Claims:

Please cancel claims 73-78, 80-82, 89-92 and 94-97 without prejudice.

The listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1. (previously presented) A clay-polymer nanocomposite comprising an organoclay which has been exfoliated into a polymer matrix, the organoclay being the reaction product of a smectite clay with a quaternary onium compound mixture, wherein the quaternary onium compound mixture comprises a diester quaternary ammonium compound mixed with an additional quaternary ammonium compound, wherein the additional quaternary ammonium compound comprises a triester quaternary ammonium compound, a monoester quaternary ammonium compound, or mixtures thereof.
2. - 3. (cancelled)
4. (previously presented) The nanocomposite of claim 1, wherein the diester quaternary ammonium compound is present as greater than 55 wt% of the quaternary onium compound mixture.
5. (previously presented) The nanocomposite of claim 1, wherein the additional quaternary ammonium compound is a triester quaternary ammonium compound and wherein the triester quaternary ammonium compound comprises less than 25 wt.% of the quaternary onium compound mixture.
6. (previously presented) The nanocomposite of claim 1, wherein the fatty acids corresponding to the esters of the diester quaternary ammonium compound and the additional quaternary ammonium compound have a degree of unsaturation such that the iodine value is from about 20 to about 90.

7. (previously presented) The nanocomposite of claim 1, wherein the additional quaternary ammonium compound is a triester quaternary ammonium compound, and wherein the diester quaternary ammonium compound comprises greater than 60 wt.% of the quaternary onium mixtures, the triester quaternary ammonium compound comprises less than 20 wt.% of the quaternary onium mixture, and wherein the fatty acids corresponding to the esters in the diester quaternary ammonium compound and the additional quaternary ammonium compound have a degree of unsaturation such that the iodine value is from about 30 to about 70.
8. (previously presented) The nanocomposite of claim 1, wherein the additional quaternary ammonium compound is a triester quaternary ammonium compound, and wherein the diester quaternary ammonium compound comprises greater than 62 wt% of the quaternary onium mixture, the triester quaternary ammonium compound comprises less than 17 wt% of the quaternary onium mixture and wherein the fatty acids corresponding to the esters in the diester quaternary ammonium compound, and wherein the additional quaternary ammonium compound have a degree of unsaturation such that the iodine value is from about 40 to about 60.
9. (previously presented) The nanocomposite of claim 1, wherein the additional quaternary ammonium compound is a triester quaternary ammonium compound and wherein the diester quaternary ammonium compound comprises greater than 62 wt.% of the quaternary onium mixture, the triester quaternary ammonium compound comprises less than 17 wt.% of the quaternary onium mixture, and wherein the fatty acids corresponding to the esters in the diester quaternary ammonium compound and the additional quaternary ammonium compound have a degree of unsaturation such that the iodine value of the fatty acids is from about 45 to about 58.
10. (previously presented) An organoclay comprising the reaction product of a smectite clay with a quaternary onium compound mixture wherein the quaternary onium compound mixture comprises a diester quaternary ammonium compound mixed with an additional quaternary ammonium compound, wherein the additional quaternary ammonium compound comprises a triester quaternary ammonium compound, a monoester quaternary ammonium compound, or mixtures thereof.

11. (cancelled).
12. (previously presented) The organoclay composition of claim 10, wherein the diester quaternary compound comprises greater than 55 wt.% of the quaternary mixture.
13. (previously presented) The organoclay composition of claim 12, wherein the additional quaternary ammonium compound is a triester quaternary ammonium compound, and wherein the triester quaternary ammonium compound comprises less than 25 wt% of the quaternary onium mixture.
14. (cancelled).
15. (previously presented) The organoclay composition of claim 10, wherein the fatty acids corresponding to the esters in the diester quaternary ammonium compound and the additional quaternary ammonium compound have a degree of unsaturation such that the iodine value is from about 20 to about 90.
16. (previously presented) The organoclay composition of claim 10, wherein the additional quaternary ammonium compound is a triester quaternary ammonium compound, and wherein the diester quaternary ammonium compound comprises greater than 60 wt.% of the quaternary onium mixture, the triester quaternary ammonium compound comprises less than 20 wt.% of the quaternary onium mixture, and wherein the fatty acids corresponding to the esters in the diester quaternary ammonium compound and the additional quaternary ammonium compound have a degree of unsaturation such that the iodine value is from about 30 to about 70.
17. (previously presented) The organoclay composition of claim 10, wherein the additional quaternary ammonium compound is a triester quaternary ammonium compound, and wherein the diester quaternary ammonium compound comprises greater than 62 wt.% of the quaternary onium mixture, the triester quaternary ammonium compound comprises less than 17 wt.% of the quaternary onium mixture, and wherein the fatty acids corresponding to the esters in the diester

quaternary ammonium compound and the additional quaternary ammonium compound have a degree of unsaturation such that the iodine value is from about 40 to about 60.

18. (original) The organoclay composition of claim 10, wherein the fatty acids corresponding to the esters of the diester quaternary ammonium compound and the additional quaternary ammonium have a degree of unsaturation such that the iodine value is from about 45 to about 58.

19. (original) The organoclay composition of claim 10, wherein the smectite is selected from the group consisting of hectorite, montmorillonite, bentonite, beidellite, saponite, stevensite and mixtures thereof.

20. (original) The organoclay composition of claim 19, wherein the smectite comprises hectorite.

21. - 30. (cancelled).

31. (previously presented) A method for preparing a nanocomposite comprising:

contacting a smectite clay with a quaternary onium compound mixture comprising a diester quaternary ammonium compound mixed with an additional quaternary ammonium compound, wherein the additional quaternary ammonium compound comprises a triester quaternary ammonium compound, a monoester quaternary ammonium compound, or mixtures thereof; and

intermixing an organoclay with a polymer matrix.

32. (previously presented) The nanocomposite of claim 31, wherein the diester quaternary ammonium compound comprises greater than 55 wt.% of the quaternary onium compound mixture.

33. (previously presented) The nanocomposite of claim 31, wherein the additional quaternary ammonium compound is a triester quaternary ammonium compound and wherein the triester quaternary ammonium compound comprises less than 25 wt.% of the quaternary onium compound mixture.

34. (cancelled).

35. (previously presented) The nanocomposite of claim 31, wherein the fatty acids corresponding to the esters of the diester quaternary ammonium compound and the additional quaternary ammonium compound have a degree of unsaturation such that the iodine value is from about 20 to about 90.

36. (previously presented) The nanocomposite of claim 31, wherein the additional quaternary ammonium compound is a triester quaternary ammonium compound, and wherein the diester quaternary ammonium compound comprises greater than 60 wt.% of the quaternary onium mixture, the triester quaternary ammonium compound comprises less than 20 wt.% of the quaternary onium mixture, and wherein the fatty acids corresponding to the esters in the diester quaternary ammonium compound and the additional quaternary ammonium compound have a degree of unsaturation such that the iodine value is from about 30 to about 70.

37. (previously presented) The nanocomposite of claim 31, wherein the additional quaternary ammonium compound is a triester quaternary ammonium compound, and wherein the diester quaternary ammonium compound comprises greater than 62 wt.% of the quaternary onium mixture, the triester quaternary ammonium compound comprises less than 17 wt.% of the quaternary onium mixture, and wherein the fatty acids corresponding to the esters in the diester quaternary ammonium compound and the additional quaternary ammonium compound have a degree of unsaturation such that the iodine value is from about 40 to about 60.

38. (previously presented) The nanocomposite of claim 31, wherein the additional quaternary ammonium compound is a triester quaternary ammonium compound, and wherein the diester quaternary ammonium compound comprises greater than 62 wt.% of the quaternary onium

mixture, the triester quaternary ammonium compound comprises less than 17 wt.% of the quaternary onium mixture, and wherein the fatty acids corresponding to the esters in the diester quaternary ammonium compound and the additional quaternary ammonium compound have a degree of unsaturation such that the iodine value is from about 48 to about 58.

39. (previously presented) The nanocomposite of claim 31, wherein the smectite clay is further subjected to a shearing treatment.

40. (previously presented) The nanocomposite of claim 31, wherein the organoclay is further subjected to shearing.

41. (previously presented) The method of claim 31, wherein intermixing the organoclay with the polymer matrix further comprises extruding the organoclay with the polymer matrix.

42. – 44. (cancelled).

45. (previously presented) The nanocomposite of claim 1, wherein the diester quaternary ammonium compound, triester quaternary ammonium compound, and monoester quaternary ammonium compound, are the reaction products of C₁₂-C₂₂ fatty acids or the hydrogenation products thereof, or a mixture of such acids, with an alkanolamine in the presence of an acid catalyst wherein the ratio of fatty acids to alkanolamine is from about 1.40 to about 2.0.

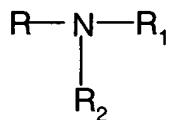
46. (previously presented) The organoclay of claim 10, wherein the diester quaternary ammonium compound, triester quaternary ammonium compound, and monoester quaternary ammonium compound, are the reaction products of C₁₂-C₂₂ fatty acids or the hydrogenation products thereof, or a mixture of such acids, with an alkanolamine in the presence of an acid catalyst wherein the ratio of fatty acids to alkanolamine is from about 1.40 to about 2.0.

47. (previously presented) The nanocomposite of claim 31, wherein the diester quaternary ammonium compound, triester quaternary ammonium compound, and monoester quaternary ammonium compound, are the reaction products of C₁₂-C₂₂ fatty acids or the hydrogenation

products thereof, or a mixture of such acids, with an alkanolamine in the presence of an acid catalyst wherein the ratio of fatty acids to alkanolamine is from about 1.40 to about 2.0.

48. (previously presented) A nanocomposite comprising an organoclay which has been exfoliated into a polymer matrix, the organoclay being a reaction product of a smectite clay with a quaternary ammonium component, wherein the quaternary ammonium component is prepared by a method comprising:

mixing at a temperature of about 70 °C a C₁₂-C₂₂ fatty acid or mixture of fatty acids having an iodine value of from about 3 to about 90, with an alkanolamine of the formula:



wherein R, R₁ and R₂ are independently selected from C₂-C₆ hydroxyalkyl groups, and wherein the molar ratio of the fatty acid to the alkanolamine is from about 1.4 to about 2.0,

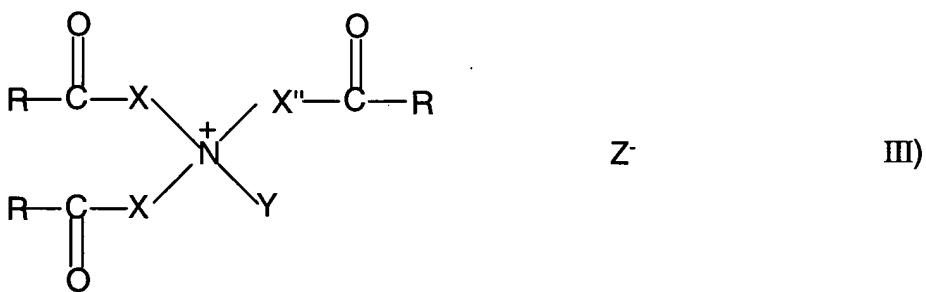
increasing the temperature of the mixture of the fatty acid and the alkanolamine from about 70 °C to a range of from about 170 °C to about 250 °C, wherein the rate of temperature increase is maintained at an average rate of greater than about 0.4 °C per minute to produce a mixture of about 55 wt % of a diester compound and less than 25 wt% of a triester compound; and

alkylating the produced diester and triester compounds with an alkylating agent to form the quaternary ammonium component.

49. (previously presented) The nanocomposite of claim 48, wherein the rate of temperature increase is maintained at an average rate greater than 0.8 °C per minute.

50. (previously presented) The nanocomposite of claim 48, wherein the fatty acid is a C₁₆-C₂₂ fatty acid having an iodine value of from about 40 to about 60.
51. (previously presented) The nanocomposite of claim 48, wherein the fatty acid is a C₁₆-C₂₂ fatty acid having an iodine value of from about 45 to about 55.
52. (previously presented) The nanocomposite of claim 48, wherein the fatty acid is tallow, soy, palm, palm kernel, rape seed, canola, tall oil, lard or mixtures thereof.
53. (previously presented) The nanocomposite of claim 48, wherein the alkanolamine is selected from the group consisting of triethanolamine, propanol diethanolamine, ethanol diisopropanolamine, triisopropanol amine, diethanolisopropanol amine, ethanoldiisobutanolamine, diethanolisobutanolamine and mixtures thereof.
54. (previously presented) The nanocomposite of claim 48, wherein the molar ratio of the fatty acid to the alkanolamine is in the range of from about 1.60 to about 1.90.
55. (previously presented) The nanocomposite of claim 48, wherein the molar ratio of the fatty acid to the alkanolamine is in the range of from about 1.68 to about 1.72.
56. (previously presented) The nanocomposite of claim 48, wherein the fatty acid has less than 10% trans isomer.
57. (previously presented) The nanocomposite of claim 48, wherein the alkylating agent is selected from the group consisting of methyl chloride, benzyl chloride, ethyl chloride, diethyl sulfate, dimethyl carbonate, trimethyl phosphate, dimethyl sulfate and mixtures thereof.
58. (previously presented) A nanocomposite comprising an organoclay which has been exfoliated into a polymer matrix, the organoclay being the reaction product of a smectite clay with a quaternary ammonium component, the quaternary ammonium component comprising a

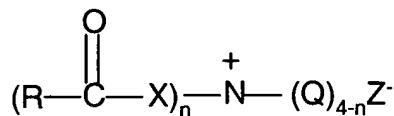
monoester compound of formula (I), a diester compound of formula (II), and a triester compound of formula (III):



wherein X, X' and X'' are the same or different and are selected from straight or branched chain, oxyalkylene or polyoxyalkylene groups having from 2-6 carbon atoms where the oxyalkylene units number from about 1-10, each R group is individually selected from straight or branched chain alkyl or alkylene groups having from 11 to 23 carbon atoms, Y is an alkylphenyl group or a straight or branched chain C₁ to C₆ alkyl or alkylene group; and Z- represents a halogen or sulfate;

wherein the diester compound comprises greater than 55 wt.% of the quaternary ammonium component and wherein the triester compound comprises less than 25 wt.% of the quaternary ammonium component.

59. (previously presented) A nanocomposite comprising an organoclay which has been exfoliated into a polymer matrix, the organoclay being the reaction product of a smectite clay with a quaternary ammonium component, the quaternary ammonium component comprising one or more compounds having the general formula (IV):



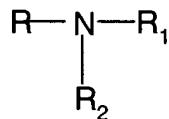
wherein n is an integer from 1 to 2, R is a C₅ to C₂₃ straight or branched chain alkyl or alkylene group, each X can be the same or different and is selected from straight or branched chain oxyalkylene or polyoxyalkylene groups having from 2-6 carbon atoms; each Q can be the same or different and is selected from a oxyalkylene or polyoxyalkylene group, or straight or branched chain alkyl, alkylene, alkyl phenyl, hydroxyalkyl, or hydroxyalkylene group, wherein at least one of the Q groups is a C₂ to C₆ linear or branched chain oxyalkylene or polyoxyalkylene capped with a C₁ to C₆ alkyl, or an alkyl phenyl group; and Z⁻ is a halogen or sulfate.

60. - 62. (cancelled)

63. (previously presented) The nanocomposite of claim 59, wherein the quaternary ammonium component comprises a diester quaternary ammonium compound and a monoester quaternary ammonium compound, and wherein the diester quaternary ammonium compound comprises at least 70% by weight of the quaternary ammonium component.

64. (previously presented) A nanocomposite comprising an organoclay which has been exfoliated into a polymer matrix, the organoclay being the reaction product of a smectite clay with a quaternary ammonium component, wherein the quaternary ammonium component is prepared by a method comprising:

reacting a C₁₁-C₂₃ fatty acid or mixture of fatty acids having an iodine value of from about 20 to about 90, with an ether alkanolamine of the formula:



wherein R is a C₂-C₆ alkyl ether, and each of R₁ and R₂ is independently selected from C₂-C₆ hydroxyalkyl groups, and wherein the molar ratio of the fatty acid to the ether alkanolamine is from about 1.4 to about 2.0; and

alkylating the product of the reaction of the fatty acid with the ether alkanolamine with an alkylating agent to form the quaternary ammonium component.

65. (previously presented) The nanocomposite of claim 64, wherein the fatty acid is a C₁₆-C₂₂ fatty acid having an iodine value of from about 40 to about 60.

66. (previously presented) The nanocomposite of claim 64, wherein the fatty acid is tallow, soy, palm, palm kernel, rape seed, canola, tall oil, lard or mixtures thereof.

67. (previously presented) The nanocomposite of claim 64, wherein the ether alkanolamine is selected from the group consisting of methoxyethyldiethanolamine, methoxypropyldiethanolamine, methoxybutyldiethanolamine and mixtures thereof.

68. (previously presented) The nanocomposite of claim 64, wherein the molar ratio of fatty acid to ether alkanolamine is in the range of from about 1.60 to about 1.90.

69. (previously presented) The nanocomposite of claim 64, wherein the alkylating agent is selected from the group consisting of methyl chloride, benzyl chloride, ethyl chloride, diethyl sulfate, dimethyl carbonate, trimethyl phosphate, dimethyl sulfate or mixtures thereof.

70. (previously presented) The nanocomposite of claim 64, wherein the alkylating agent is methyl chloride.

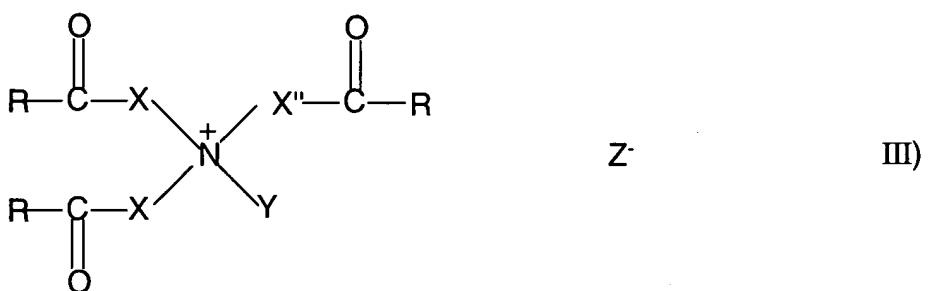
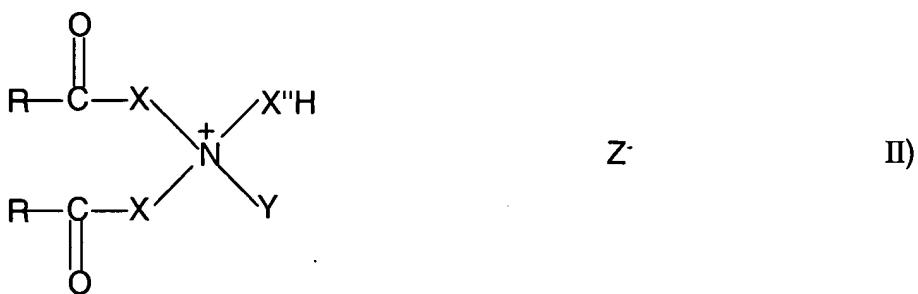
71. (previously presented) The nanocomposite of claim 64, wherein the process is conducted in the presence of a solvent.

72. (previously presented) The nanocomposite of claim 64, wherein the process is conducted in the presence of a solvent, wherein the solvent is selected from the group consisting of C₁-C₆ alcohols, glycols, fatty acid, mono-, di-, or tri-glycerides, and mixtures thereof.

73. – 82. (cancelled).

83. (previously presented) An organoclay comprising a reaction product of a smectite clay with a quaternary ammonium component, the quaternary ammonium component comprising a monoester compound of formula (I), a diester compound of formula (II), and a triester compound of formula (III):

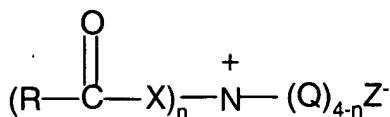




wherein X, X' and X'' are the same or different and are selected from straight or branched chain oxyalkylene or polyoxyalkylene groups having from 2-6 carbon atoms, where the oxyalkylene units number from about 1-10, each R group is individually selected from straight or branched chain alkyl or alkylene groups having from 11 to 23 carbon atoms, Y is an alkylphenyl group or a straight or branched chain C₁ to C₆ alkyl or alkylene group; and Z- represents a halogen or sulfate;

wherein the diester compound comprises greater than 55 wt.% of the quaternary ammonium component and wherein the triester compound comprises less than 25 wt.% of the quaternary ammonium component.

84. (previously presented) An organoclay comprising the reaction product of a smectite clay with a quaternary ammonium component, the quaternary ammonium component comprising one or more compounds having the general formula (IV):



wherein n is an integer from 1 to 2, R is a C₅ to C₂₃ straight or branched chain alkyl or alkylene group, each X can be the same or different and is selected from straight or branched chain oxyalkylene or polyoxyalkylene groups having from 2-6 carbon atoms; each Q can be the same or different and is selected from a oxyalkylene or polyoxyalkylene group, or straight or branched chain alkyl, alkylene, alkyl phenyl, hydroxyalkyl, or hydroxyalkylene group, wherein at least one of the Q groups is a C₂ to C₆ linear or branched chain oxyalkylene or polyoxyalkylene capped with a C₁ to C₆ alkyl, or an alkyl phenyl group; and Z⁻ is a halogen or sulfate.

85-87 (cancelled).

88. (previously presented) The organoclay of claim 84, wherein the quaternary ammonium component comprises a diester quaternary ammonium compound and a monoester quaternary ammonium compound, and wherein the diester quaternary ammonium compound comprises at least about 70% by weight of the quaternary ammonium component.

89-111. (cancelled).

112. (previously presented) The nanocomposite of claim 64, wherein the fatty acid has less than 20% trans isomer.

113. (previously presented) The nanocomposite of claim 64, wherein the alkyl ether is selected from a group consisting of, methoxyethyl ether, methoxypropyl ether, methoxybutyl ether and mixtures thereof.

114. (previously presented) The nanocomposite of claim 64, wherein the hydroxyalkyl group is

selected from a group consisting of ethanol, propanol, isopropanol, isobutanol and mixtures thereof.

115. (previously presented) The organoclay of claim 84, wherein the alkyl ether is selected from a group consisting of, methoxyethyl ether, methoxypropyl ether, methoxybutyl ether and mixtures thereof.

116. (previously presented) The organoclay of claim 84, wherein the fatty acid has less than 20% trans isomer.

117. (previously presented) The organoclay of claim 84, wherein the hydroxyalkyl group is selected from a group consisting of ethanol, propanol, isopropanol, isobutanol and mixtures thereof.